

**TREASURY DEPARTMENT
UNITED STATES PUBLIC HEALTH SERVICE**

HUGH S. CUMMING, SURGEON GENERAL

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**REPORT OF
COMMITTEE ON SANITARY CONTROL
OF THE SHELLFISH INDUSTRY
IN THE UNITED STATES**

Submitted to the Surgeon General of the United States
Public Health Service in Compliance with Resolutions
Adopted February 19, 1925, by a Conference of Federal,
State, and Municipal Authorities with Representatives of
the Shellfish Industry

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LETTER OF TRANSMITTAL

BALTIMORE, MD., September 28, 1925.

The SURGEON GENERAL,
United States Public Health Service,
Washington, D. C.

SIR: I have the honor to transmit herewith the report of the committee which was appointed by the conference of February 19, 1925, under instructions to formulate recommendations for the sanitary control of the shellfish industry in the United States, in accordance with the general principles and policies set forth in the resolutions adopted by that conference.

As the first step in its procedure the committee has sought technical information and advice from all available sources, chiefly through the subcommittee organized for that purpose. Following this, tentative recommendations formulated by a special subcommittee have been fully discussed by the whole committee, chiefly through correspondence, and modified in so far as necessary to conform to the consensus of opinion of the committee.

As to most of the measures proposed, the committee is unanimous in its recommendations. As to certain other recommendations the committee is not unanimous, but in such cases the recommendations as presented have the approval of not less than two-thirds of the full membership. Regarding other questions, the technical data at present available are insufficient to justify definite conclusions, and recommendations on these matters are deferred pending the collection and consideration of additional data which are now being collected and which are expected to be available in the near future.

The committee proposes as early as possible to submit one or more supplementary reports dealing with these matters on which no recommendation has as yet been made, and perhaps discussing more fully other matters on which only tentative recommendations are made in this report.

Respectfully,

W. H. FROST, *Surgeon, Chairman.*

REPORT OF THE COMMITTEE

DEFINITION

The shellfish comprised within the scope of the original reference to this committee include oysters, hard clams (quahaug or little-neck clams), soft clams, razor clams, saltwater mussels, and scallops. From the standpoint of sanitary control, these different varieties are of unequal importance, due to differences in their biology, in the quantities consumed, and to prevailing customs in methods of production and distribution and in preparing them for food. Because of these differences, any system of sanitary control which is properly applicable to one variety requires more or less modification for application to other varieties.

The discussions and recommendations presented in this report refer specifically to oysters. In their application to other varieties they are subject to certain modifications which will be presented later in a supplementary report.

I. Outline of Measures Required for Sanitary Control of the Shellfish Industry

The essential requirements for insuring the safety and cleanliness of shellfish sold in the market are:

(1) That only those should be marketed which have come from beds, which, on careful examination, are found to be free from any justifiable suspicion of dangerous contamination with disease-producing microorganisms and free from such other contamination as might be in any way deleterious or offensive.

(2) That subsequent to their removal from the water all the conditions of handling, storage, and distribution should be such as will adequately safeguard the shellfish from—

(a) Any dangerous contamination with pathogenic organisms, and

(b) Such nonpathogenic contamination, deterioration (spoilage), or adulteration as might render them less fit for food, either hygienically or aesthetically.

(3) That thorough epidemiological studies be made of all epidemics where there is ground for any suspicion that shellfish may have been responsible, in order that the sources of infection may be promptly and accurately traced and measures taken to prevent further infections.

II. Policy and Organization for Control

The carrying out of these provisions implies that the production and distribution of shellfish should be under supervision by responsible and competent officials, a supervision which begins with the waters from which the shellfish are taken and extends through all the processes of handling and distribution until the shellfish are delivered to the ultimate consumer. In the interest of the public health this supervision should be sufficiently rigid to fully protect the public against any really existent and actually preventable hazards to health; but obviously it should not go beyond this to the imposition of nonessential restrictions which are unduly burdensome and costly.

As it frequently happens that shellfish produced in one area are shipped to and consumed in a quite distant area, often in another State, there should be a rational and effective coordination of control as between the producing and the receiving areas. Moreover, if the protection afforded, alike to the public and to the industry, is to be general and uniform, as it should be, the supervision in comparable areas (i. e., in similar stages of production and distribution) should be substantially uniform.

The obvious need for such coordination and uniformity has led to the suggestion that supervision should be exercised by the Federal Government to a considerably greater extent than at present. However, there is no single department of the Federal Government and no group of departments which has the necessary statutory authority and organization to exercise such effective control as would justify it in assuming chief responsibility to the public. It is assumed, therefore, in making the recommendations which follow, that responsibility for control of the shellfish industry will continue to rest, as at present, chiefly upon the individual States, and that the requisite coordination and uniformity of control will be achieved by mutual agreement between the States, with such assistance and co-operation as existing Federal bureaus are prepared to render. It is believed that such a plan will be feasible for immediate operation, since each State already has full jurisdiction within its own territory and either has or may easily provide the necessary statutes, administrative agencies, and organization for carrying out, within its own area, all control measures which may reasonably be required.

In accordance with this principle, it is expected that each producing State will be directly responsible for the effective regulation of all production and handling of shellfish within its confines, not merely for the protection of its own citizens but equally for safeguarding such of its product as goes to other States. It is recommended that the producing State should clearly recognize its re-

sponsibility for the safety of the shellfish shipped into other States by issuing a "certificate" covering the product. Such statement should certify that, on the evidence of careful and competent official inspections, the shellfish have been produced and handled in conformity with the regulations of the producing State. It is not advisable nor proper that this statement should go beyond what the responsible State authority is actually in a position to certify of its own knowledge. It should be remembered that the actual protection afforded by a certificate is measured not by the force of the language used but by the efficiency of the control behind it, and that over-strong certification can serve no purpose except to deceive and ultimately to bring disrepute upon the certifying authority which fails to recognize and admit the limitations to its actual control.

The receiving State, being thus dependent upon the efficiency of the control exercised in the producing State for its protection against contamination in beds, floats, and subsequent processes of handling, is entitled to full information concerning the control actually exercised in each producing State in order that judgment may be formed and action taken accordingly. It is the opinion of the committee that the United States Public Health Service is the proper agency to collect this information and make it available to the State authorities. It is, therefore, suggested that the United States Public Health Service may render a valuable service by undertaking systematic surveys of the machinery and efficiency of sanitary control as actually established in each producing State and reporting thereon periodically for the information of the authorities of other States and of the United States Bureau of Chemistry in connection with the supervision which the latter exercises over interstate shipments. It is believed that such reports should include not merely a summary of facts but also an expression of opinion as to whether the control exercised in each producing State is actually efficient and reliable. Whether these reports should be published or should be distributed only to responsible authorities is a matter of policy which should obviously be left to the discretion of the Public Health Service. In either case, aside from their value as information, such reports will certainly have great influence in stimulating the development of better control and in promoting substantial uniformity of practice on a higher plane.

It is assumed, in making this suggestion, that in addition to this special function, if it is undertaken, the Public Health Service, the Bureau of Chemistry, and the Bureau of Fisheries, all of which are concerned with the sanitary control of the shellfish industry, will continue and extend the services which they are already rendering, especially in conducting scientific investigations of fundamental importance to control and in serving as clearing houses for the inter-

change of information and the discussion of policies between State authorities. It is suggested that these bureaus establish some permanent arrangement for mutual interchange of information and co-ordination of activities.

In any effective plan of concerted control it is necessary that the State which receives shellfish, as well as the State which produces them, should recognize and discharge certain definite responsibilities; namely—

(1) To make and enforce such regulations relative to the handling and distribution of the shellfish received into its jurisdiction as may be necessary to prevent contamination and spoilage. This is necessary primarily for protection of its own citizens, but also in justice to producing States, which otherwise might unjustly be held responsible for resultant injury.

(2) To make thorough and prompt investigation of all illness suspected to have been caused by contamination of shellfish, making every effort to trace to their original source or sources any shellfish which may be found or justly suspected to have been responsible. In this the producing States and the United States Public Health Service should cooperate.

III. Specific Recommendations Relative to Scope and Enforcement of State Regulations for the Sanitary Control of Shellfish

A. PROTECTION AGAINST CONTAMINATION OF SHELLFISH IN THE BEDS FROM WHICH THEY ARE TAKEN

The essential requirements, as previously stated in general terms, are that no shellfish should be offered for sale except such as have been taken from beds which, after careful and competent examination, are found to be free from any justifiable suspicion of contamination which is judged to be either dangerous or offensive.

In order that these requirements may be actually and effectively fulfilled, with substantial uniformity in all producing areas and with justice alike to the public and to the industry, provision for enforcement should be made in each producing State as follows:

(1) Definite authority should be vested in some official State agency to designate areas from which shellfish may and those from which they may not be taken. The powers conferred upon such agency should be discretionary; that is, the agency should be empowered to close an area whenever, in its discretion, this may be advisable. The procedure whereby such action may be taken should be as simple and expeditious as is consistent with the establishment of proper safeguards against arbitrary action. Opportunity should be given in all cases for a fair hearing of any interests affected by the decision.

It is generally desirable, as an aid to the exercise of this authority, that fishermen be required to procure a license from the State agency for the taking of shellfish.

(2) With respect to areas designated as unfit for the taking of shellfish for marketing, the State agency should have full authority to specify the conditions, if any, under which shellfish may be taken for purposes other than marketing, as for seed or for relaying.

(3) In order that its statutory authority may be effectively exercised, the State agency should be provided with sufficient funds, sufficient personnel of the proper training, and sufficient equipment actually to make such careful and reliable examinations as will serve to distinguish between areas which are safe and those which are unsafe.

(4) The State should provide a police force sufficient actually to enforce the orders of this agency with respect to sanitary regulations governing the taking of shellfish.

(5) To promote substantial uniformity in the practice of different States with respect to the approval of areas for shellfish culture, the following recommendations are made:

(a) All areas from which shellfish are taken or are likely to be taken should be personally inspected by officials having competent technical training and field experience.

(b) The inspection should consist of a survey which takes careful account of all the determinable factors affecting pollution, namely, the sources of actual or potential contamination, summarized in a quantitative way and considered in relation to dilution, tides and current, and time intervals between these sources and the shellfish beds. Special attention should, of course, be given to sources of contamination with human excreta, taking into consideration the methods of sewage disposal in use on the watershed. The survey should also include bacteriological examinations sufficient to aid and check the judgments formed from other data, and the findings in each survey should be made a matter of permanent record. The surveys should be repeated in each area as frequently as may be necessary to keep informed of any material changes in status of safety.

(c) The requirements as to sanitary quality of the waters overlying shellfish beds should be that the areas must be so protected against existing or probable sources of pollution by artificial treatment of sewage when this is necessary and by the natural safeguards of dilution and time (for natural purification) that, under the most unfavorable conditions which are likely to arise during the open season for marketing, the shellfish will not be exposed to fecal contamination in a dangerous concentration. In sparsely populated areas, even where there is no direct discharge of sewage from the shore, careful attention should be paid to the likelihood of contamination in coves and inlets from sources which would be insignificant in relation to a large and well-mixed body of water. Careful consideration should also be given to the likelihood of contamination

from boats, either passenger boats or fishing boats, especially in small and shallow bodies of water and in the vicinity of main ship channels.

The committee is not prepared to recommend any precise bacterial standards for waters from which the taking of shellfish is permitted until additional data which are now being collected have been assembled and considered. In the light of present knowledge it would probably be unfair and unnecessary to apply to such waters the rigid standards which are applied to the drinking water supplied in interstate commerce. It is considered, however, that the waters should ordinarily not show the presence of *B. coli* in 1 c. c. amounts, tests for *B. coli* being made in 10 c. c., 1 c. c., and 0.1 c. c. amounts, according to the Standard Methods of the American Public Health Association.¹

(d) It seems to be a quite well established and general fact that oysters taken from their beds in winter, when the temperature of the water is lower than about 50° F., show much less contamination with *B. coli* than do the oysters taken from the same beds in seasons when the temperature is higher. This fact, together with certain other observations upon the feeding habits of oysters under natural and experimental conditions, has led some of the foremost authorities on the subject to conclude that at low temperatures (probably below 50° F.) oysters go into a state of hibernation. It is claimed that while they are in this state the oysters cease feeding and that, their shells being tightly closed, they are not exposed to contamination from the surrounding waters, but on the contrary undergo a process of natural purification, whereby the *B. coli* originally present in the shell liquor and body cavity are destroyed. According to this view, shellfish taken from their beds during the season of hibernation are protected from dangerous contamination not only by the natural safeguards which protect the overlying waters but also by the additional safeguard of self-purification during hibernation.

Concerning the application of this principle in a system of sanitary control of the shellfish industry, the committee has not as yet reached full agreement, due to the fact that certain of its members are not fully satisfied with the evidence which has so far been presented. It is understood, however, that additional data, which are now being compiled, will be available in the near future. Therefore, a recommendation in this matter is deferred for the present until these supplementary data can be considered by the committee. It is expected, however, that a recommendation will be made before the onset of winter.

(e) It has been abundantly demonstrated that oysters grown in polluted waters, if removed during the active feeding season and relaid in a large body of clean water, effectively and thoroughly cleanse themselves of bacterial contamination. The time required for complete cleansing is not precisely determinable, doubtless varying somewhat under different conditions, but the process appears to be a fairly rapid one in oysters which are actively feeding. The legitimate application of this principle in a system of sanitary control is a matter of considerable economic importance, since it makes

¹ In making these tests the dilution water used should be of approximately the same salinity as the sample.

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available for the growing of oysters many areas which are admirably adapted to this purpose though subject to such pollution that shellfish taken directly from them are unsafe. It is obvious, however, that if permission be granted to remove oysters from polluted beds for marketing after they have been relaid in clean water for a designated period, there is grave danger that unscrupulous persons may market them without relaying or after relaying for an insufficient period. The committee, therefore, recommends that the removal of oysters from polluted areas (i.e., areas which do not meet the requirements specified under (c) above) be permitted ordinarily only during the closed season for marketing² and not less than 15 days prior to the opening of the next market season, so that the period of relaying must of necessity be not less than 15 days, and that such removal be allowed only under a special permit from the State authority in control.

In special circumstances, when the rigid application of this general rule would result in serious loss to the industry, it is considered that permission may properly be granted by State authorities to remove shellfish from moderately polluted areas during the open season and to market them after relaying in a large body of clean water, but subject only to the following conditions:

(ea) That such permission be granted only to individuals known to be thoroughly responsible and trustworthy and only under a special permit, subject to heavy penalty or forfeiture of a heavy bond in case of any violation of the conditions of the permit.

(eb) That such special permits be issued only for removal from privately owned or leased beds which are not exposed to excessive pollution.

(ec) That the shellfish be relaid in a designated area of clean water for such period as may be prescribed by the State authority, having due regard to the degree of pollution of the original beds but *in no case* for less than seven days.

(ed) That the temperature of the water during the period of relaying be not less than 60° F.

(ee) That the State authority granting the permission exercise such vigilant supervision as to insure that all the conditions prescribed are actually fulfilled.

(ef) That when the period of relaying is less than 15 days the State authorities should require such bacteriological examination as may be necessary to establish that the oysters conform to accepted bacteriological standards of purity.

(f) There is also evidence that living oysters in the shell may be rather rapidly and effectively cleansed of bacterial contamination by appropriate artificial treatment with chlorinated sea water.

The subcommittee designated to study and report upon this process finds that all the evidence so far available is distinctly favorable, and considers that the procedure presents most encouraging possibilities of future development. The committee has, therefore, already recommended to the Surgeon General of the Public Health Service that that bureau undertake a thorough study of the process during

² The closed season for marketing oysters is defined in some States by law, in others only by custom. In most States on the Atlantic seaboard the closed season extends from May 1 to September 1.

the current season with a view to more precisely determining its applicability.

Pending the results of such study this committee does not feel justified in recommending that sole reliance be placed upon this process as a sufficient safeguard against infection from shellfish taken from beds which fail to pass a satisfactory inspection. It is, however, most heartily recommended that State authorities and the industry interest themselves actively in studying and perfecting the process and in developing it as an additional safeguard for treatment of shellfish which have been taken from approved sources.

It is proposed, when the studies now in progress shall have progressed to a sufficiently definite conclusion, to render a further report upon the applicability of artificial purification processes.

B. PROTECTION AGAINST CONTAMINATION OF SHELLFISH IN PROCESSES OF HANDLING, SUBSEQUENT TO REMOVAL FROM BEDS

The general requirement, as previously stated, is that all the processes of handling oysters, from the time that they are taken from the beds until they have been packed, ready for shipment, should be under such inspection and control as will insure them against dangerous or offensive contamination or spoilage, and that records be kept which will facilitate tracing market lots to their sources.

The effective fulfillment of this requirement implies that in each producing State some official agency should be vested with full authority to prescribe regulations for the handling of oysters and provided with funds, personnel, and equipment sufficient to maintain such efficient inspection as will insure that these regulations are fully and consistently complied with.

Considering the processes of handling shellfish in their usual sequence, it is recommended that they be subject to regulation substantially as follows:³

(1) In the transportation of shellfish from the beds from which they are taken to the packer or shipper it should be required—

(a) That the vessels in which the shellfish are transported be kept in such state of cleanliness that the shellfish will not be dangerously or offensively contaminated.

(b) That the physical conditions of storage be such that the shellfish will be kept alive and fresh. The provisions implied under this requirement will vary in different localities according to the range of temperature conditions and the period of time that is likely to elapse before the shellfish are delivered.

(c) That the producer furnish to the receiver a true record of the source or sources from which the shellfish were taken, and that such record be kept by the receiver, subject to inspection by the official State agency.

³ The substance of these recommendations is already embodied in the regulations in force in a number of shellfish-producing States.

(2) That the "floating" or "drinking" of shellfish, or their storage in water, should be permitted only under the following conditions:

(a) The waters in which they are floated or stored should not be subject to dangerous or offensive contamination. In this connection it is proper to require that the standards of purity for waters in which shellfish are floated should be at least as rigid as for the beds from which the shellfish are taken. It is potentially dangerous to lay shellfish in floats which are in such proximity to dwellings, industrial plants, or boats which are tied up that the protection of the floats depends upon strict observance of sanitary police regulations by all persons in the vicinity. Wherever floating or wet storage is practiced it is preferable and should be required that the purity of the water be insured either by location at a safe distance from all sources of dangerous contamination or by the use of tanks with effective means for artificial purification of the water under careful and responsible supervision. In the latter case the water used should be free from gross pollution before artificial purification.

(b) The waters in which the shellfish are floated or stored should be of proper salinity, as specified by the State agency in control, having due regard to the salinity of the waters from which the shellfish were taken. Ordinarily the salinity in floats should be such that the shellfish will thrive in the water.⁴ This is of secondary importance as a public-health matter, but has some relation to the vitality and keeping qualities of the floated stock.

(c) Appropriate limits should be set by the official State agency to the time that the shellfish may be allowed to remain in floats. These limits may properly vary in different localities, depending upon various biological conditions.

(3) Shucking and packing plants should be operated under the following regulations:

(a) Each plant should operate under a license granted by the official State agency, such license to be granted only after inspection has shown that the plant conforms to requirements in location, construction, equipment, and operation. The plant should be subject at all times to inspection by the proper authorities.

(b) The operator should be required to keep a true record of all lots of shellfish received at the plant, showing, for each lot, the date received, the amount, the immediate source, and, so far as possible, the ultimate source. These records of lots received should be identified as accurately as possible with the records of lots shipped from the plant. The records should be subject at all times to inspection by the State agency.

(c) The plant should be of such construction and arrangement as will facilitate the maintenance of cleanliness and the observance of proper sanitary precautions in all operations. Considerations of obvious importance in this connection are: Adequate lighting; proper ventilation; the use of such materials and construction as to permit of thorough cleansing by flushing and prompt, efficient drainage; sanitary toilets; adequate and convenient washstands and

⁴ By a decision of the Department of Agriculture (F. I. D. 121) oysters are regarded as adulterated within the meaning of the Federal food and drug act if floated in water of a salinity less than that in which they will grow to maturity.

towels for workers; proper arrangements for disposal of refuse; and protection against flies.

(d) The plant should be provided with an ample and convenient supply of cold water of established purity, for washing the shucked stock, and an adequate supply of either steam or hot (boiling) water for cleaning and sterilizing utensils.

(e) All receptacles in which shucked shellfish are placed, and other utensils which come into contact with the shucked product, should be of noncorroding metal with smooth surfaces and of such shape as will facilitate thorough mechanical cleansing. They must be kept scrupulously clean and be sterilized daily before using.

(f) Shucked stock should be well washed in cold water of assured purity in an apparatus of approved construction, and subsequent to this washing should not be handled except with clean utensils which have been properly sterilized.

(g) Employees should be required to wear outer garments of washable material, kept as clean as the nature of their work will permit, to wash their hands thoroughly on beginning work and after each visit to the toilet, and in all other respects to be cleanly in their habits. From the standpoint of minimizing the risk of intestinal infections, habits of strict personal cleanliness of all employees are among the most important items in plant sanitation. Every effort should be made to drill employees in such habits, to facilitate them by convenient arrangement of the plant, and to enforce them by constant supervision of responsible foremen.

(h) Due precautions should be taken to exclude from the plant any persons suffering with a communicable disease or with infected wounds upon the hands or arms and to discover and exclude carriers of the germs of intestinal infections.

The precautions taken to this end should be those which are usually required in the case of other food handlers. The actual efficiency of these precautions will depend to a considerable degree upon the efficiency of the local public health organization. It is, however, considered proper and should be generally practicable to require the following:

(ha) To inspect and question all applicants for employment, to observe any evidence of active infection, and to ascertain whether the applicant has previously suffered an attack of typhoid (or paratyphoid) fever or has recently been in intimate contact with any such case. This examination should preferably be made by a physician, but, if this is not practicable, it should at least be made by an intelligent and competent person under instructions from the State or local health department, and all suspicious cases should be referred to a physician.

(hb) In the case of any individual giving a history of a previous attack of typhoid fever or suspected typhoid, to require a bacteriological examination of stools and urine in the laboratory of the State department of health or in such other laboratory as that department may designate and approve. Any carriers of typhoid (or paratyphoid) bacilli thus detected should, of course, be excluded from employment.⁵

⁵ The committee has considered and discussed at length the proposal that a bacteriological examination of stools and urine of all employees be required. Such examinations are now required (annually) in at least two States. This policy is commendable where

(*hc*) Cases of illness occurring among employees, especially if the symptoms are such as to suggest incipient typhoid fever or other gastrointestinal infection, should be promptly referred to a competent physician for diagnosis.

(*hd*) The local health authorities should cooperate with employers by promptly advising them of any cases of typhoid fever or other gastrointestinal infections reported in employees or their families. There should, moreover, be full cooperation between employers and local physicians, especially in communities where the local health departments are not well organized.

C. PROTECTION AGAINST CONTAMINATION OF SHELLFISH IN PACKING, SHIPMENT, AND DISTRIBUTION, AND PROVISION FOR TRACING THE SOURCES OF SHELLFISH OFFERED IN THE MARKET

The general requirements are that all the conditions of packing, transportation, and distribution should be such as will safeguard the shellfish against dangerous or offensive contamination or spoilage and will facilitate tracing to its original source any lot of shellfish offered in the retail market.

Details of procedure recommended in fulfillment of these requirements are as follows:

METHODS OF SHIPPING

Shell stock:

1. Shell oysters (and clams) should be packed in clean barrels or sacks, plainly marked with the name and address or identification mark of the shipper.

2. All shippers, reshippers, packers, and wholesalers should keep an accurate record, subject to inspection by proper officials, of all lots received, shipped, and sold. All retailers should keep an accurate record, subject to inspection by proper officials, of all lots received.

3. Shell oysters should be handled under such temperature conditions as will keep oysters alive—that is, at a temperature below 50° F., but not at freezing temperature. Detailed instructions to this effect should be printed on barrel, sack, or tag.

Shucked stock:

1. All shipping containers should be washed and sterilized by an approved method before being filled.

2. Shucked oysters should be packed in containers sealed in such a manner that any tampering is easily discernible and marked with the name and address or identification mark of shipper or packer.

conditions in the industry and the facilities available to the State health authorities render it practicable to make such examinations with an outlay of effort and expenditure which is not unduly burdensome to the industry and does not result in curtailing other work of the health department of greater importance to the public. However, the subcommittee which was appointed to study and report on this proposal did not consider that such a requirement was necessary or practicable of general enforcement at this time, and in this view a majority of the committee concur.

It is considered preferable, in the interest of cleanliness, that shipments be packed in sealed nonreturnable containers, but the committee does not feel justified at this time in recommending that the use of returnable containers be prohibited.

3. For the refrigeration of shucked stock outside containers should be provided for ice, and no ice or other foreign substance should be allowed in contact with the shellfish. Shucked stock should be kept at a temperature of 50° F. or below from the time it leaves the shipper until the time it reaches the consumer, but should not be allowed to freeze.

Shucked stock—Storing, displaying, dispensing:

1. All shucked stock received by wholesalers or retailers should be kept in the original sealed containers, which should not be opened except as required for dispensing by the retailers.

2. Shucked stock in bulk should be sold only under the following conditions:

(a) Containers from which they are dispensed should be marked with the name and address or identification mark of the shipper.

(b) An accurate record, subject to inspection by proper officials, should be kept on file, showing distribution by shipper, packer, and wholesaler. Retail stores and restaurants should keep an accurate record of all lots, showing from whom received.

(c) When container is opened, either by packer, wholesaler, or retailer, it should be done under the proper sanitary precautions. All utensils coming in contact with the raw food should be sterilized before use, in accordance with approved methods, and containers furnished by the dealer for dispensing to customers must be clean. The manual handling of oysters should be prohibited.

(d) Persons handling shucked stock in retail dispensing should be subject to the same regulations and supervision that apply to other food handlers.

(e) Any adulteration or the addition of any water or ice should be prohibited.

(f) The display of shucked stock in open cans, windows, or showcases should be prohibited.

(g) Proper refrigeration should be provided in all places, including retail stores where shucked stock is kept.

D. BACTERIOLOGICAL STANDARDS FOR SHELLFISH

Bacteriological examinations of shellfish, made in accordance with the Standard Methods of the American Public Health Association, which are generally accepted as authoritative in this country, serve as a test for the presence and approximate numbers of bacteria of a certain kind, the so-called *B. coli* group, which are characteristic of the fecal discharges of man and other warm-blooded animals. Such bacteria are inevitably found in all surface waters in numbers proportionate to the degree of contamination with human and animal

discharges which have found their way into the water in sewage or surface drainage. They are not in themselves harmful, but serve, in the examination of water, to indicate the degree of contamination with the fecal discharge of man or certain of the lower animals. The probability that the water may contain typhoid bacilli and other dangerous disease-producing germs of like origin can be inferred only roughly and somewhat indirectly when the bacteriological findings are considered in connection with a survey of the drainage area, taking into account the ratio of human to animal pollution and the probable prevalence of typhoid fever in the human population.

In shellfish freshly removed from their beds the numbers of *B. coli* present are, in a general way, proportionate (though not in any fixed ratio) to the numbers present in the waters overlying the beds. Moreover, it appears from the evidence available that bacteria of the *B. coli* group do not tend to multiply in shell stock after removal from the water so long as the shellfish are kept alive and in a thriving condition. Consequently, the bacteriological examination of fresh shellfish, in the shell, affords a fair index of the probable cleanliness or contamination of the waters from which the shellfish were taken and of the probable safety of such shellfish for food.

In the process of shucking the content of *B. coli* may be increased by contamination from hands and utensils or by washing in dirty water. It tends to be decreased by careful washing with clean water. It appears, from such evidence as is now available, that the bacterial score of shellfish need not be materially increased in the process of shucking and packing where careful precautions of cleanliness are observed.

Shucked shellfish form a very favorable medium for the growth of *B. coli* and other organisms, and during storage of the shucked stock the numbers of *B. coli* originally present may be greatly increased by multiplication. This multiplication of *B. coli* in shucked stock is favored by high temperatures (60° to 110° F.), while it is retarded or checked by temperatures below 50° F. An increase in bacterial score due to such multiplication should not be interpreted as an index of increasing danger of infection, since it is highly improbable that shellfish taken from clean water sources would contain any typhoid bacilli, even though they did contain small numbers of *B. coli*. Moreover, there is no direct evidence that typhoid bacilli, even if present, would multiply in shucked shellfish.

These facts as stated must be kept constantly in mind in the interpretation of the bacterial score of any sample of shucked shellfish taken from original sealed containers some days after the contents were packed. If the bacterial (*B. coli*) score is low, this

undoubtedly indicates that the shellfish have come from a clean source, have been handled in a cleanly manner, and that the shucked stock has been kept under conditions which have excluded further contamination and prevented multiplication of bacteria of the *B. coli* type. On the other hand, if the bacterial (*B. coli*) score be high, this may indicate either (1) that the shellfish were obtained from a polluted source, or (2) that they had been shucked and packed under uncleanly conditions, or (3) that the container had been opened and the contents contaminated after shipment, or (4) that temperature conditions after packing had been favorable for the multiplication of such *B. coli* as might originally have been present. It is evident, therefore, that a high *B. coli* score which, on freshly opened shellfish, would indicate gross sewage contamination, does not necessarily bear this interpretation in the case of shucked stock which has been subjected to storage.

With these considerations in mind, it is the opinion of the committee that, in judging the safety of shellfish, chief reliance should be placed (1) on the system of inspection and sanitary control of the beds from which such shellfish are taken and of the processes of shucking and packing, and (2) upon bacteriological examination of shell stock and of shucked stock as packed at the shucking plant. Bacterial examinations of shucked stock sampled in the market are subject to such a variety of interpretations that they are unreliable as a means of judging the presence or absence of dangerous contamination.

Relative to methods of examination and standards of bacterial content the committee recommends:

(1) That the Standard Methods of the American Public Health Association be followed.

(2) That pending the collection and analysis of further data, now being collected, the generally current standard for shellfish—that is, a standard *B. coli* score not exceeding 50—be continued, with the understanding that if the facts collected warrant it, this recommendation will be altered.

E. EPIDEMIOLOGICAL INVESTIGATIONS OF THE RELATION OF SHELLFISH TO TYPHOID FEVER AND SIMILAR DISEASES

Whenever any outbreak of typhoid fever or other disease of similar origin occurs under circumstances which give rise to a suspicion that shellfish may have been responsible, the circumstances should be promptly and thoroughly investigated by a skilled epidemiologist, to ascertain whether or not the infection has in fact been conveyed by shellfish, and, if so, to trace these to the source where the contamination occurred. This is of importance primarily in order that measures may be taken immediately to prevent further

infection from the same source. It is also important, in justice to the industry and the public, to identify the true source of infection as accurately and promptly as possible, to avoid casting unjust suspicion upon other sources, and especially to avoid unjust injury to the reputation of the industry at large.

The responsibility for such investigations rests primarily upon the local and State authorities of the State in which the cases occur; but, as the investigation will frequently point to a source of infection in some other State, interstate cooperation is essential. The committee considers it proper, therefore, to recommend that in the event of such outbreaks, especially where two or more States are concerned, the State authorities should request the United States Public Health Service to undertake or assist in the investigation, and that the Public Health Service maintain a staff of selected, trained epidemiologists to be promptly available for this purpose.

In addition, the committee would call attention to the importance of more exhaustive continuing studies of typhoid fever, especially in the larger cities, where the facilities for such studies are more likely to be available, with a view to accumulating more extensive and precise information upon the importance of shellfish as factors in the endemic prevalence of typhoid fever. It is only through such studies that we may hope to extend and correct our present imperfect knowledge on this subject, and better to adjust measures of prevention.

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APPENDIX

RESOLUTIONS ADOPTED BY THE CONFERENCE ON SHELLFISH POLLUTION, WASHINGTON, D. C., FEBRUARY 19, 1925

RESOLUTIONS ADOPTED AS A BASIS FOR PERMANENT OYSTER CONTROL

1. The beds on which shellfish are grown must be determined, inspected, and controlled by some official State agency and the United States Public Health Service.

2. The plants in which shellfish are shucked or otherwise prepared or packed by the shipper must be inspected and controlled by some official State agency and the United States Public Health Service.

3. The freedom from typhoid bacilli, of the workers who handle shellfish, must be determined by some official governmental agency.

4. Failing to secure sufficiently high standards to protect the people as regards beds, floating and plumping practices, and methods of shucking, or other methods of preparation, a satisfactory practical method of pasteurization or other heat treatment, or chemical, or biological method which produces satisfactory results, must be installed and operated under proper governmental supervision.

5. There must be such governmental supervision and such trade organization as will make plain the source of shellfish and will prevent shellfish from one source being substituted for those from another source. This will be chiefly a problem of the individual State.

6. The methods of shipping must be supervised, inspected, controlled, and approved by the proper official Federal and interstate agency.

7. The methods of storing, displaying for sale, and dispensing must be determined, inspected, and controlled by the proper State or city agency.

8. The product must conform to an established bacterial standard and must meet Federal, State, and local laws and regulations relative to salinity, water content, and food proportion, and must conform to the pure food laws standards.

SUPPLEMENTARY RESOLUTIONS

That the chairman of the meeting appoint a committee on which shall be represented the United States Public Health Service, the Department of Agriculture, Bureau of Chemistry, Bureau of Fisheries, representatives of the oyster industry and of the public health forces—Federal, State, and local—to whom procedures shall be referred for prompt action and advice in conformity with the resolutions adopted this afternoon.

That the committee be empowered to appoint special committees either from their membership or from outside to cope with certain phases of the situation.

That the committee to be appointed by the Surgeon General consider seriously the question of revision of the Standard Methods which have been adopted by the American Public Health Association governing the sanitation of oysters, and that after receiving such evidence, it be referred to the committee on standard methods of the American Public Health Association, and that before being incorporated as a portion of this program, it should come back to your committee for final approval.

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